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QUEBRACHO WOOD AND ITS SUBSTITUTES.

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CONTENTS.

	Page.
Woods called quebracho	5
Distribution and supply of quebracho	5
The quebracho tree	6
Quebracho wood	6
Uses of the wood	8
General	8
Crossties	8
Tannin extract	8
Importation of quebracho into the United States	9
Substitutes for quebracho	10
White quebracho (Quebracho blanco)	10
Red quebracho (Quebracho colorado)	11
Key for the identification of quebracho wood and its substitutes	11

ILLUSTRATIONS.

PLATES.

	Page.
PLATE I. The wood of quebracho. Fig. 1.—Transverse section. Fig. 2.—Tangential section. Fig. 3.—Radial section	12
II. The wood of white quebracho. Fig. 1.—Transverse section. Fig. 2.—Tangential section. Fig. 3.—Radial section	12

TEXT FIGURE.

FIGURE 1. Distribution of the quebracho tree	7

QUEBRACHO WOOD AND ITS SUBSTITUTES.

WOODS CALLED QUEBRACHO.

Quebracho (*Quebrachia lorentzii* Griseb.), a South American wood yielding a valuable extract much used in the United States for tanning high-grade leathers, is not the only wood known by that name. Two other and inferior species, *Aspidosperma quebracho-blanco* Schlecht and *Aspidosperma quebracho-colorado* Schlecht, are called white quebracho, or "quebracho blanco, " and red quebracho, or "quebracho colorado," respectively. These two, however, belong to an entirely different family (*Apocynaceae*), including the common dogbane or Indian hemp, from the true quebracho, which is a member of the sumac family (*Anacardiaceae*). The name quebracho is derived from two Portuguese words, "quebrar," meaning break, and "hacha," ax, in allusion to the extreme hardness of the wood. At one time nearly every South American wood that quickly dulled an ax was called quebracho, but to-day the three woods mentioned are the only ones of commercial importance to which the name is applied.[1] This indiscriminate use of the name quebracho naturally has resulted in much confusion regarding the identity, distribution, and uses of these woods, and the purpose of this circular is to give the uses and distinguishing characteristics of each. Throughout, the true quebracho will be referred to simply as quebracho, while the two other species will be called white quebracho and red quebracho, respectively.

DISTRIBUTION AND SUPPLY OF QUEBRACHO.

Quebracho is found in Argentina, Bolivia, Brazil, Paraguay, and Uruguay. (See map.) It is distributed from the Andes eastward for approximately 500 miles, and from near the mouth of the Parana River northward for about 600 miles, thus growing over a territory of 300,000 square miles. A few writers claim that the Province of Santiago, Chile, once yielded quebracho, but nothing definite exists to show that it ever extended that far westward. Its commercial range is confined chiefly to northern Argentina, in the Provinces of Tucuman, Santiago del Estro, and Santa Fe, and the Territories of Formosa

[1] In Porto Rico a sapindaceous shrub (*Thouinia stricta* Radlk.), noted for its very hard wood, is called quebracho. In Cuba there is a "quebracho" tree (*Copaifera hymenæifolia* Moric.), belonging to the bean family (Leguminosae). In Chile and Honduras the name quebracho is given to a species of *Acacia*, another member of the bean family. "Quebracho flojo" or "sombra de toro" (*Iodina rhombifolia* H. and A.) is a handsome evergreen tree of Argentina belonging to the sandalwood family.

and the Chaco, and to the Chaco of Paraguay. It is comparatively rare in Bolivia and Uruguay, and in the Provinces of Salta and Jujuy, Argentina.

At the present rate of consumption, the supply of quebracho appears to be practically inexhaustible. Owners of quebracho timber claim that an average acre yields approximately 2 tons of the wood. A very conservative estimate of the total possible yield from the areas where quebracho occurs in commercial quantity places it at 168,000,000 tons, while the present yearly consumption of the wood for all purposes is a little less than 1,000,000 tons. The consumption, however, because of the scattering way in which quebracho grows, entails the cutting over each year of about 500,000 acres.

The price of quebracho lands varies greatly. In Paraguay they bring, as a rule, from $6,000 to $7,000 per square league,[1] (approximately 4,633 acres), or about $1.50 per acre, though some areas can be purchased for as little as from 15 to 25 cents per acre. In the Argentine Chaco, on the other hand, certain tracts near railroads or waterways sell for $2 per acre or more.

THE QUEBRACHO TREE.

Quebracho never grows in pure stands, but is scattered through open forests composed of many species. Seldom, in fact, are more than four or five quebracho trees found on an acre. It usually attains a height of from 50 to 70 feet, and a diameter of from 2 to 4 feet. It is neither a mountain nor a river-bottom tree, but grows best in the somewhat elevated stretches between the water courses, or in other situations with sandy soil and moderate atmospheric and abundant soil moisture. Its growth during early life is very rapid, fence posts being obtained in 10 years, but in later life is very slow. Little is known, however, concerning its average rate of growth to maturity. So far it has been free from attack by insects.

QUEBRACHO WOOD.

The heartwood of quebracho is one of the hardest, heaviest, and, in the region of its occurrence, most durable woods known. Highly tempered tools are required to work even the young green wood, and old wood is almost as hard as metal. It weighs about 78 pounds per cubic foot, and has a specific gravity of from 1.2 to 1.4, sinking, of course, in water. Nine quebracho ties of the size used in Argentina weigh a ton. Its lasting qualities are such that, in Argentina, ties of the wood appear to remain indefinitely in a perfect state of preservation. Logs left in the woods have been found absolutely sound after 25 years. The wood contains a very large amount of tannin, which

[1] Daily Consular Report, January 11, 1911.

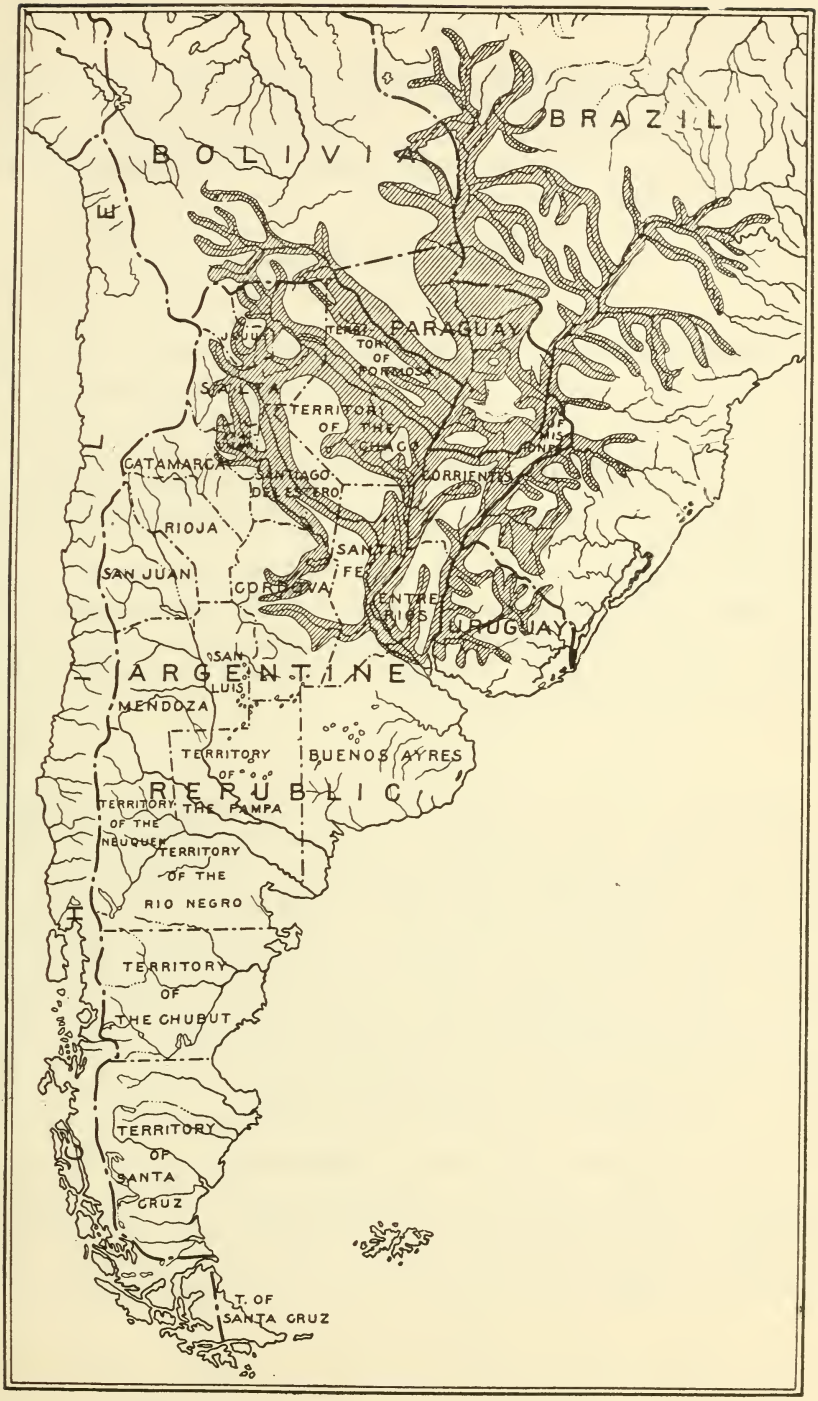

FIG. 1.—Distribution of the quebracho tree (*Quebrachia lorentzii*).

acts as a preservative, and to which its extraordinary durability has been ascribed.

The sapwood of quebracho, forming about one-third of the whole, is nearly white. The heartwood, when freshly cut, is dark cherry-red, but becomes much darker with age. It is fine-grained and takes a beautiful polish. When thoroughly seasoned it does not warp, nor is it likely to check during seasoning.

USES OF THE WOOD.

GENERAL.

Quebracho wood is one of the principal commercial products of South America. Though its qualities fit it for use in many ways, its value for tanning extract and crossties is so great that nearly the entire annual cut is put to one or the other of these uses. In Argentina, however, where it is commercially most important, quebracho is employed for more purposes, though not in greater quantity, than any other wood.

There, because it is proof against decay, it finds place in wharves, dry docks, and quays, and as fence posts, beams, and cross arms. It is also used for bridge and ship building, general construction, furniture, and interior finish. The timber is usually seasoned for from two to four years before being used.

CROSSTIES.

Quebracho has been adopted throughout its range as a standard crosstie timber, and is gradually replacing the cast-iron ties once common. In Argentina quebracho ties for broad-gauge roads are 9 feet long, 10 inches wide, and 8 inches thick, and sell for from $2 to $2.50 each. The wood is so hard that spikes can not be driven into it, and holes must be bored clear through a tie for bolts to fasten the rails. About 18 quebracho ties are got from the average acre, a yield which appears small when contrasted with the 40 to 60 first-class white oak or pine ties obtained from an acre of our native forest. The difference is compensated, however, when it is remembered that the life of a quebracho tie may be practically indefinite, while that of our best native ties is seldom greater than eight years. Practically all the quebracho cut for ties is used in South America. Quebracho ties have been tried experimentally in the United States, but were found to lack resiliency and to crack badly with frost. The expense of boring holes for bolts was also another item against them.

TANNIN EXTRACT.

The heartwood of quebracho yields from 20 to 24 per cent of tannin, the sapwood from 3 to 4 per cent, and the bark from 6 to 8 per cent. It is this remarkable production, varying in different parts of the

tree's range, which justifies the extensive use for tan extract of a wood so valuable for other purposes. The bark and sapwood are seldom utilized, a fact which seems to indicate unnecessary wastefulness, since the tannin content of the former is equal to that of the lower grades of our native tanbarks; while the content of the latter is but slightly below that of our native chestnut wood.

Besides tannin, quebracho wood contains considerable, though relatively small quantities of red, gambier-like coloring matter used as a filler. Quebracho extract does not contain enough of the nontannin materials to produce by itself well-nourished leathers, and is therefore mixed in the proportion of 1 to 4, by weight, with other tannin material, such as the extracts of mangrove and chestnut, which are stronger in nontannin substances.

When cut for tan extract the trees are cleaned of their bark, sapwood, and branches, and then brought to the factory, where they are reduced to shavings or small chips. These are boiled or steamed to release the tannin, and the resulting fluid extract is evaporated to a thick paste, which, when dry, goes to the market in sacks or barrels. The cost of cutting quebracho logs and bringing them to the factory is much greater than that of manufacturing the extract itself. At present logs are hauled chiefly by ox teams to the nearest railroad or boat landing, and from there shipped to the reducing mill. It is in Paraguay, where quebracho trees are very scattered, that the transportation of logs is most difficult and expensive. Little or no market exists for quebracho timber or extract there, and practically all of the wood is shipped to Buenos Aires, where it is either consumed for extract or exported.

Quebracho obtained from the Provinces of Santiago del Estero and Santa Fe, Argentina, is particularly rich in tannin, and there also the trees reach their largest size. It is chiefly in these Provinces that quebracho is being extensively lumbered, the output steadily increasing from year to year. In the Provinces of Salta and Jujuy, where quebracho is rare, the inhabitants prefer for tannin the bark of two trees, *Acacia cebil* Griseb. and *Piptadenia cebil* Griseb., locally known as cebil. These barks are exceedingly rich in tannin material, in the case of the latter, at least, containing from 19 to 25 per cent.

IMPORTATION OF QUEBRACHO INTO THE UNITED STATES.

Quebracho wood and extract are now the leading exports of Argentina and Paraguay. Since their introduction in 1888, imports of these into the United States have increased steadily. In 1910, 38 per cent of all the tannin material used in the United States was quebracho. Nearly all of this came from Argentina. Table 1 shows the quantity and value of material imported during the fiscal years 1907 to 1910, inclusive.[1]

[1] Compiled from Bureau of Statistics Bulletins 76 and 90, Imports of Farm and Forest Products.

TABLE 1.—*Imports of quebracho wood and extract into the United States, 1907–1910.*

Year.	Wood.		Extract.	
	Tons.	*Value.*	*Pounds.*	*Value.*
1907	66,810	$840,779	76,033,584	$2,319,785
1908	48,871	612,971	79,186,787	2,260,364
1909	66,113	731,795	102,004,981	2,740,530
1910	80,210	1,058,647	95,183,073	3,021,902

Quebracho wood enters the United States free of duty. A duty of from one-half to three-fourths of a cent per pound, however, is levied on the extract, which, in the new (1909) tariff schedule, is divided into two classes, according to its density or the percentage of tannin it contains. If less in density than 28° Baumé [1] the duty is one-half cent; if greater it is three-fourths of a cent. Transportation from Argentina to the United States is so cheap that many importers bring in logs and extract the tannin in this country, thus saving the high import duty. The price of quebracho extract f. o. b. Montevideo or Buenos Ayres, the two principal exporting points, is from $80 to $85 per ton, and that of logs from $14 to $20 per ton.

SUBSTITUTES FOR QUEBRACHO.

Both of the other woods which go to the market as quebracho, the white and the red, yield a relatively low percentage of tannin, and it is therefore unlikely that they are knowingly substituted to any extent for the true quebracho. Often, however, they may unintentionally be substituted for quebracho, through similarity of names. Quebracho is frequently called quebracho colorado, and red quebracho is also called this, and often merely quebracho. White quebracho, too, goes under the latter name. While quebracho and red quebracho may resemble each other superficially, white quebracho is readily distinguished from either by its light color. White quebracho is commercially more important than the red, and in some parts of South America has been used as a substitute for quebracho. It yields a much lower percentage of tannin, but the tannin itself is not essentially different from that of quebracho.

WHITE QUEBRACHO (QUEBRACHO BLANCO).

White quebracho is common throughout the regions where quebracho grows. It is most abundant in the wetter parts of northern Argentina, in the Provinces of Cordova, Santa Fe, Catamarce, Santiago del Estero, the southern portion of Tucuman, and the Chaco. It is an evergreen tree, reaching a height of from 60 to 100 feet, a

[1] An arbitrary scale devised by Baumé. It may be reduced to specific gravities by the following formulas: (*a*) For liquids heavier than water, sp. gr.$=\frac{144}{144-X}$. (*b*) For liquids lighter than water, sp. gr.$=\frac{144}{134+X}$, X in each case being the reading by Baumé's scale.

diameter of from 1 to 3 feet, and remarkable for its erect stem and wide spreading crown. It is usually less bulky than quebracho, and branches nearer the ground, features which help to distinguish it in the forest.

The wood is strong, hard, and very heavy (specific gravity from 0.88 to 1.1), very close-grained, yellowish white in color, with a pinkish or rosy tint. It is not very durable in contact with the soil, yet much in demand for fence posts, rafters, flooring, railroad trucks, cross-ties, cabinet work, turnery, hubs, spokes, and cogwheels. Its dense, uniform structure makes it suitable as a substitute for boxwood (*Buxus sempervirens L.*) in wood engraving. Unless very carefully seasoned, however, it is likely to warp and twist, and is said to be subject to insect attack.

RED QUEBRACHO (QUEBRACHO COLORADO).

Red quebracho is also abundant throughout quebracho's range. Its wood when freshly cut is red, but becomes dark brown with age. It is used for practically the same purposes as white quebracho. Although in general its structural characters are similar to those of the former, it is said to be more durable in contact with the soil. While red quebracho may at first sight be mistaken for quebracho, its structural characters distinguish it. Moreover, its commercial importance is relatively so small that it is seldom mixed with the other wood.

KEY FOR THE IDENTIFICATION OF QUEBRACHO WOOD AND ITS SUBSTITUTES.

As an aid in distinguishing the wood of quebracho from that of the two inferior species, a key is given, in which are included such gross characters of the woods as may be seen in a smooth transverse section with the aid of a hand lens. For the use of students, several of the minute characters, which can be seen only under the high power of a compound microscope, are also included. Plates I and II show magnified transverse sections of quebracho and white quebracho wood. The structure of red quebracho is so similar to that of white that an illustration of it is unnecessary.

Pores (*vessels*) small (0.03 to 0.09 millimeters), open, and regularly distributed; tangential bands of large pores usually alternating with bands of smaller pores. *Wood-parenchyma fibers* abundant, scattered throughout the wood, often arranged in short tangential lines. *Wood fibers* 0.9 to 1.5 millimeters long. *Heartwood* dark pink, hard, and heavy (about 62 pounds per cubic foot).

(*Aspidosperma quebracho-blanco* Schlecht.)

Similar in structure to above, but heartwood red, becoming dark brown with age.

(*Aspidosperma quebracho-colorado* Schlecht.)

Pores (*vessels*) larger (0.10 to 0.13 millimeters), closed (in the heartwood) and irregularly distributed, usually grouped in radial rows of from two to four. *Wood-parenchyma fibers* confined to proximity of vessels, often forming conspicuous groups. *Wood fibers* very small in diameter (0.5 to 1.2 millimeters long). All cells of the heartwood are crowded with a yellowish-brown substance. *Heartwood* dark cherry-red, very hard, and heavy (about 78 pounds per cubic foot).

(*Quebrachia lorentzii* Griseb.)

Approved:

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *March 15, 1912.*

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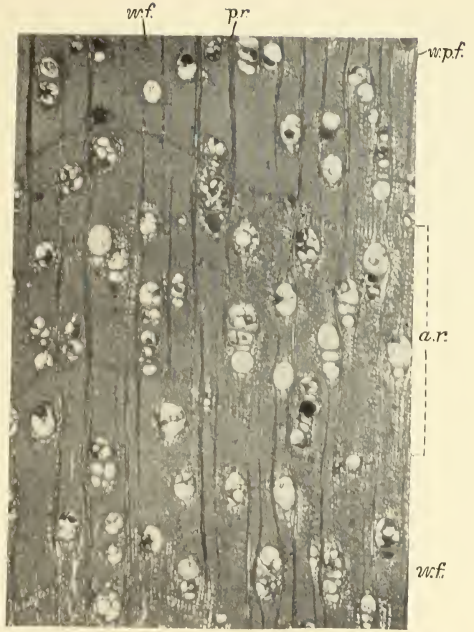

Fig. 1.—Transverse section of the wood of quebracho (*Quebrachia lorentzii*) showing one entire annual ring of growth (*a. r.*); *v.*, vessel; *w. f.*, wood fibers; *w. p. f.*, wood-parenchyma fibers; *p. r.*, pith ray. Magnified 25 diameters.

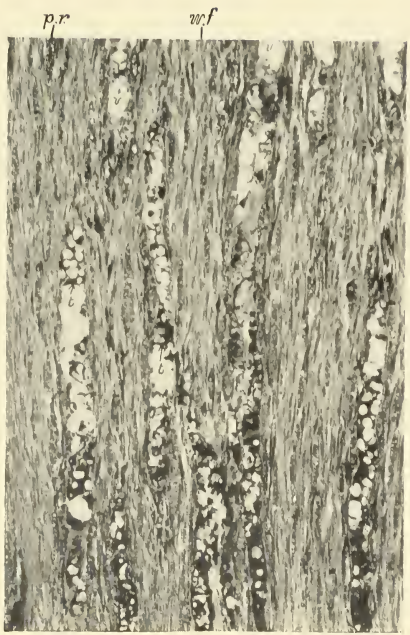

Fig. 2.—Tangential section of the wood of quebracho (*Quebrachia lorentzii*); *v.*, vessel; *p. r.*, pith ray; *w. f.*, wood fibers; *t.*, tyloses. Magnified 25 diameters.

Fig. 3.—Radial section of the wood of quebracho (*Quebrachia lorentzii*); *v.*, vessels; *w.f.*, wood fibers; *p. r.*, pith rays; *t.*, tyloses. Magnified 25 diameters.

THE WOOD OF QUEBRACHO.

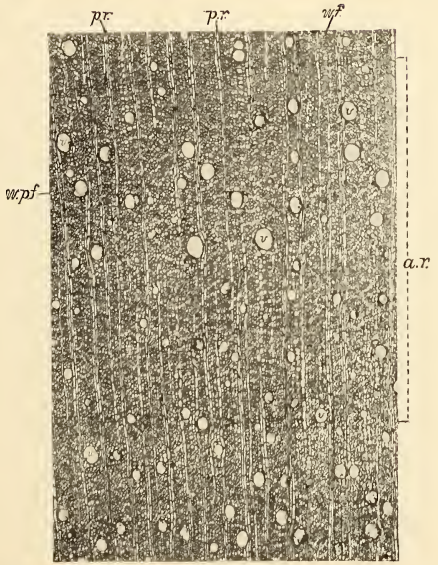

Fig. 1.—Transverse section of the wood of white quebracho (*Aspidosperma quebracho-blanco*) showing parts of two annual rings of growth; *v.*, vessels; *w. f.*, wood fibers; *w. p. f.*, wood-parenchyma fibers; *p. r.*, pith rays. Magnified 25 diameters.

Fig. 2.—Tangential section of the wood of white quebracho (*Aspidosperma quebracho-blanco*); *v.*, vessel; *w. f.*, wood fiber; *w. p. f.*, wood-parenchyma fiber; *p. r.*, pith ray. Magnified 25 diameters.

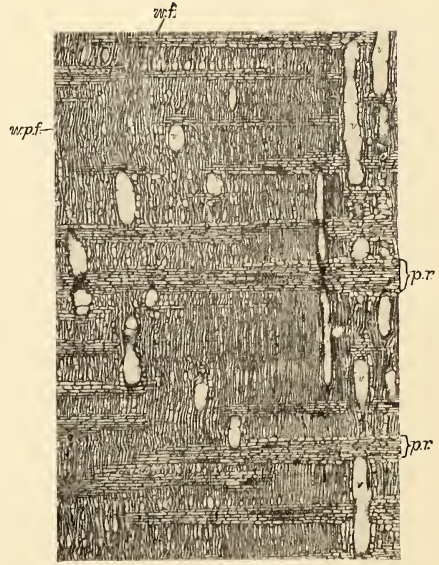

Fig. 3.—Radial section of the wood of white quebracho (*Aspidosperma quebracho-blanco*); *v.*, vessel; *w. f.*, wood fibers; *w. p. f.*, wood-parenchyma fibers; *p. r.*, pith rays. Magnified 25 diameters.

THE WOOD OF WHITE QUEBRACHO.

PLATE II.